Issues from the 1997 Army After Next Winter Wargame

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MR-988-A

PREFACE

The Army After Next (AAN) project, led by the Training and Doctrine Command (TRADOC), was initiated by the Chief of Staff of the Army (CSA) in February 1996. The project's goals are to link Force XXI to a long-term vision of the Army—extending well into the next century—and to ensure that this vision informs evolving Army research and development requirements. The Arroyo Center is supporting TRADOC in this effort.

As part of the AAN project, TRADOC is conducting a series of high-level wargames to explore issues affecting the development of the U.S. Army circa 2010. The first was held at the Center for Leadership Development at the Army War College from January 27 to February 7, 1997. The Arroyo Center's role is to assist TRADOC by (1) providing an analytical framework to evaluate the AAN, based on RAND's "strategies-to-task" methodology; (2) identifying issues, derived from strategic objectives in the framework, that could be explored in the wargames; (3) managing the collection of data from high-level participants in the games; and (4) assessing game results. This report addresses the design of the Winter Wargame, suggests improvements in its execution, and also discusses the role of the wargame process in a broader AAN analysis.

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BACKGROUND AND PURPOSE

The Army After Next (AAN) project was designed to link Force XXI to
a long-term vision of the Army and to ensure that this vision informs
Army research and development efforts. As part of the AAN project,
TRADOC is conducting a series of high-level wargames to identify
and explore issues affecting the development of the Army in the next
century.

RAND's Arroyo Center is assisting TRADOC in three ways. First, it is
providing a framework, based on RAND's "strategies-to-task"
methodology, to evaluate the AAN. Second, it is identifying issues to
explore in the wargames. Finally, it is helping manage the collection
of data from the wargames and assessing the results.

This report focuses on the wargame conducted in the winter of 1997
or the Winter Wargame (to distinguish it from a series of preparatory
wargames played in the fall of 1996 to provide input for the winter
game). It has four purposes. It evaluates the implications of the
game design and execution for strategic-level analysis, it identifies is-
sues and insights from the game, it suggests improvements to the
AAN wargame design, and it articulates the role of wargaming in
supporting the broader aims of the AAN study.

ISSUES

The Winter Wargame produced a large number of issues. These fall
into two general categories, those that challenge assumptions about

concepts of operation and those that challenge assumptions about the capabilities and concepts for the Army After Next.

Issues Pertaining to Concepts of Operation

These combine into four issue sets:

- Combat in space
- Nature of cyberwar
- The effect of "soft kills"
- Tempo of combat operations

Combat in space. The Winter Wargame provided a glimpse into a future where military operations occur in an uninterrupted spectrum from beneath the ocean surface to outer space. Blue's military posture depended heavily on space assets (too much so, in the view of some observers). Both sides had a number of weapons for attacking objects in space or terrestrial targets from space, and military operations aimed at controlling space dominated the game. This intense focus raises issues about how much the United States should rely on space assets, about policies for attacks on space systems or ground support assets, and policies for the use of private, foreign, or international assets during wars.

Game participants concluded that the United States depended too much on space assets because their loss had such a catastrophic effect on Blue Battle Forces. Arroyo Center observers, however, were unwilling to go this far; few potential adversaries will have the capabilities to launch a massive attack against U.S. satellites, and the few that do will probably be reluctant to risk U.S. retaliation for anything less than truly vital interests. Furthermore, fiscally feasible alternatives may not be possible. The United States needs to pursue a multifaceted strategy involving arms control measures, passive defense, and offensive systems.

Nature of cyberwar. Military planners are only beginning to come to grips with conflict in "cyberspace," the interconnected net of computers that stretches across the globe. The wargame provided a good opportunity to think through some of the problems associated with

war in a virtual world. Issues emerging in this area include the characterization of cyberwar operations: Are they deterrent or offensive? What constitutes an unambiguous indication of a cyberwar attack? Issues on organization for and integration of cyberwar into military operations, including the nature of their effects, also emerged.

Game players had an ambivalent attitude toward cyberwar operations. Some viewed them as possible adjuncts to sanctions that could be imposed in an attempt to end a conflict short of war. Others regarded them as clearly offensive operations and were concerned that they could wreak such havoc that they would escalate hostilities rapidly. Part of this ambivalence stems from the lack of knowledge about the effects of such attacks. Players might be willing to accept the risk of escalation or reprisal if they were assured of gaining a significant advantage, e.g., neutralizing an enemy's anti-satellite capability. Risking the reprisal while being uncertain of the success caused players to avoid attacks until after the outbreak of hostilities. This was true even though the players could not specify what they would regard as unambiguous evidence of a cyber attack.

Much work remains to be done in this area, both on the technical side of understanding the effects of such attacks and on the policy side of deciding how to respond.

The effect of "soft kills." Typically, military planners rely on explosive blast and shock to destroy enemy systems. But other types of destruction are possible. The effects of an electromagnetic pulse from a nuclear weapon have long been understood, lasers have considerable destructive potential, and computer viruses can disable communications systems. A number of issues emerged from considering the effects of weapons that destroy equipment with effects other than blast or shock. One was whether such kills can be decisive or have to be followed up by traditional attacks. Another issue revolved around the likelihood of such attacks escalating the conflict. Players were also interested in the vulnerability of their forces to such attacks.

Some of the same difficulties affecting cyber operations pertain here. Players generally concluded that soft kills would not be decisive on their own and would have to be accompanied by traditional attacks to accomplish military objectives. Blue players tended to regard such

attacks as less threatening than conventional ones, but Red opted not to use them because they saw potential for escalation. Again, this area requires more analysis, particularly as U.S. perceptions differ from those of potential antagonists.

Tempo of combat operations. Traditional conflicts have moved at a pace that allowed political leaders to formulate policies on the aim and conduct of the conflict. When coalitions of allies are involved, cycles are even slower. During the wargame, technology allowed the pace of conventional operations to outstrip the political decision-making cycle. For example, intercepting a missile attacking U.S. satellites in the boost phase of its trajectory requires a decision within minutes. Failure to act could cost one side or the other all of its space-based assets.

This increased tempo raises complex issues about delegation of authority. For example, the Blue National Command Authority refused to delegate authority to attack Red submarines off the east coast of the United States if they were detected preparing for hostilities. The players concluded that this was a matter of educating the command authority. The Arroyo Center team suggests an alternative approach, one of designing forces in light of the political reality that the command authority will not further delegate decision authority. Thus, U.S. forces may need to be able to withstand an initial strike and still be able to respond.

Assumptions About the Army After Next Force

The Army After Next is not a planned force; it is, rather, a conceptual force that embodies technologies likely to be available in 2020. Nonetheless, several assumptions have been made about this force that the wargame challenged. These pertain to its structure, its unique capability, its role, its mission, and its operational concept.

Force structure. Generally, it is assumed that capable forces deter hostilities. The Winter Wargame revealed a more complex picture. Red's view of the AAN Blue force as highly capable led it to adopt almost a "circuit breaker" mentality: either avoid war (and likely defeat) at all costs, or, if war seems inevitable, attack massively and preemptively with the hope of evening the odds. On the Blue side, the presence of very effective forces almost created a demand for

their use, regardless of the situation. In both cases, these attitudes led to a rapid escalation and expansion of conflicts.

Capability. The key capability of the AAN force is its ability to destroy enemy ground forces. It does this through very mobile light forces supported by sophisticated information systems that enable it to engage enemy forces with precision and at long range. These capabilities overlap those of the other services in the AAN period. This duplication is not undesirable per se, but it does suggest that AAN capabilities are not unique.

Role. Traditionally, a key role for Army forces has been the holding of terrain. However, the AAN force is ill suited for this role. Heavier forces that will comprise 70 percent of the 2020 force could support the AAN force in this role, but the AAN force might have to slow its pace of operations and advance so that the heavier forces could keep up.

Mission. The game assumed that operations in urban terrain was not part of the AAN force's mission. However, the rapid-deployment capability of the force tempts policymakers to use it in fast-breaking crises, regardless of its suitability for the mission. Rapid arrival alone is not enough; the force needs to be able to carry out the mission.

Operations. The Winter Wargame suggests an assumption that U.S. forces will increasingly be CONUS-based. However, a modest improvement in opponent deployment capabilities bestows on them the option for a quick grab of territory close to their own border. Whether CONUS-based forces can deploy quickly enough to stop such an attempt is problematic.

A BROADER CONTEXT

The ultimate goal of the AAN study is to design and field a force and develop operational concepts for the 2020 period. The issues selected for the game are explored against a postulated force structure, operational concept, and scenarios. TRADOC conducts a variety of activities, such as seminars and studies, to inform the structures, concepts, and scenarios. But the connection is not as tight as it could be. Needed is an overarching strategy that embeds the AAN wargames into the study process.

ACKNOWLEDGMENTS

ACRONYMS

AAN   Army After Next

FWG   Fall Wargame

GBL   Ground-based laser

GPS   Global Positioning System

IO   Information Operations

NCA   National Command Authority

NEO   Noncombatant evacuation order

OOB   Order of Battle

PGM   Precision-guided munitions

SLBM   Submarine launched ballistic missile

UAV   Unmanned aerial vehicle

USG   United States government

WMD   Weapons of mass destruction

WWG   Winter Wargame

INTRODUCTION

BACKGROUND

By approximately 2010, equipment fielded to support Force XXI will be entering its wear-out period. Replacement weapon systems and supplemental operational concepts will thus be needed to ensure the timely phasing of Army After Next (AAN) in the 2025 time frame.

To help senior Army leaders anticipate how changes in international relations, technology, and organization may affect combat during the first quarter of the new century, the Chief of Staff of the Army initiated TRADOC's AAN project in February 1996. The project's goals are to link Force XXI, the transitional Army between the current force and the AAN, to a long-term vision of the Army, extending well into the next century, and to ensure that this vision informs evolving Army research and development requirements. Among other things, it will test potential future U.S. forces against those of major competitors who might emerge in Europe or Asia.

To implement the project's charter, TRADOC has created an AAN Project Office responsible for conducting broad studies of warfare through the year 2025. These studies include a series of seminars, workshops, conferences, research projects, and several wargames, including annual wargames played over a week or more and involving hundreds of participants from various levels of the national security community.

The objectives listed below were developed by TRADOC and together articulate the broad goals of the AAN study.

- By 2020, can qualitative advantages offset quantity in a war of strategic depth and width? If so, how?

- In 2020, what elements of a strategic posture deter and prevent conflict?

- How can the United States control escalation or geographic expansion of war?

- What are war termination options for the United States against major competitors?

- What are the strategic and operational implications of deployment of effective national and theater missile defenses?

- What are the strategic and operational implications of forward-based forces?

- What are the strategic and operational implications of greatly improved power sources on U.S. capabilities?

A more complete discussion of these objectives and the issues associated with them appears in Appendix A. The purpose of the AAN Winter Wargame (WWG) is to explore issues associated with the AAN objectives, and the WWG designers used these goals to shape the game's design.

The Arroyo Center was asked to analyze the strategic-level play in the WWG. We interpreted this to mean that we were to focus on those issues and insights emanating from the game that could affect national policy objectives. The mandate extended to operational and tactical issues only insofar as those cases involved national policy objectives. We interpreted this to include matters pertaining to national security and military strategy and the characteristics of a future U.S. Army circa 2020. The Arroyo Center team drafted its own goals to focus its analysis of the wargame.

The Arroyo Center's tasks consisted of assisting TRADOC by: (1) providing an analytical framework to evaluate the AAN, based on RAND's "strategies-to-tasks" methodology; (2) identifying issues, derived from strategic objectives in the framework, that could be explored in the wargames; (3) managing the collection of data from

high-level participants in the games; and (4) assessing game results.[1] The formal project description for this report is in Appendix B.

PURPOSE

This report serves two purposes: to describe the strategic issues and insights from the game and to articulate the role of wargaming in supporting the broader aims of the AAN study.

HOW THE REPORT IS ORGANIZED

The report has three parts. Chapter Two briefly describes the background of the AAN project leading to the WWG and the organization and procedures of the game. Chapter Three describes issues of future national security strategy and the characteristics of a future U.S. Army raised during the 1997 Winter Wargame. The report concludes with a proposal that future Winter Wargames become part of a unified and systematic plan for studying the AAN, with tight linkages between the inputs and outputs of the games, exercises, seminars, workshops, and other analyses that make up the current project managed by TRADOC's AAN Project Office. The report also has two appendixes, one that provides an expanded discussion of objectives and issues and one that contains the approved project description.

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[1]The first two tasks are documented in unpublished RAND research entitled "The Army After Next: Strategic Objectives and Issues for High Level War Games," September 1996. The second two are documented in unpublished RAND research by M. Dean Millot and Walter L. Perry, "The Army After Next: Initial Impressions of Winter Wargame Results," March 1997.

BACKGROUND AND ORGANIZATION
OF THE WINTER WARGAME

The objective of the AAN Winter Wargame was to identify and explore major issues associated with warfare in the 2020 time frame. Players were provided game materials in advance, which recounted the history of events leading up to the situation in 2019, the beginning date of the game. The game began with a Blue-Red confrontation over Ukraine.

ORGANIZATION

The game had a Blue and Red team playing protagonist and antagonist; a Green team, which represented all allied governments; a Pink team, representing an unallied near-peer competitor ready to exploit Red and Blue preoccupation with each other; a number of special teams; an adjudication team; and Game Direction. Blue and Red were organized identically. Each had a National Command Authority (NCA) and two unified commands, designated CINC East and CINC West. The Green team represented all other governments and international organizations. It was present to render decisions on overflight requests, base use, and so forth.

A number of special teams were formed to provide advice to both Blue and Red about such topics as space, information operations, and logistics. The game designers recognized that certain activities associated with future warfare need to be represented to ensure completeness. These activities included Information Operations (IO), Space and Missile Defense, Deployment, Sustainment and Logistics, and Weapons of Mass Destruction (WMD). The teams pro-

vided expert advice to the players and also participated in the adjudication process.

Game Direction made decisions about the game process. There was no supporting simulation, and the game format was free play. Game Direction was necessary to ensure that game objectives were accomplished. For example, Game Direction had to ensure that war broke out so that the concept of operations issues could be explored.

GAME PROCEDURES

A sequence of six game turns were executed over a period of seven days. Each NCA made a series of decisions based on its own analysis and the advice of its unified commands. Then each side would respond to the action of its opponents, and the adjudication team would make decisions on the outcomes.

The direction of the game was to be in the hands of the players, not Game Direction. The objective was to allow the players to act out their roles in the context of the scenario and thereby give direction to game play. The thinking among planners was that Game Direction interventions might repress the free flow of ideas by focusing the participants too narrowly and might therefore reduce the number of issues addressed.

The rules for the Winter Wargame consisted of two components: the results of a series of tactical wargames held at TRADOC's Analysis Command (TRAC) in the fall of 1996, and the political/military judgment of the assessment teams. The results of the tactical wargames were presented in the form of attrition and force movements for each side resulting from a series of engagements referred to as "vignettes." Because these vignettes did not cover all possible engagements and because the reported results were based on extrapolations of current capability, provisions were made for the assessors to alter reported results and to add results from engagements not included in the vignettes.[1]

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[1]This was accomplished through the use of a computer-assisted process that allowed the adjudicators to view the results of an engagement and then offered them the opportunity to modify those results. In the cases where no results were available, adjudicators were able to enter results that they considered reasonable.

ISSUES FROM THE WINTER WARGAME

The game produced a rich set of issues that form a basis for further research and analysis. The issues fall into two broad categories.

- Issues that challenge assumptions about operational concepts. These should cause the Army leadership to reexamine future warfighting concepts.

- Issues that challenge assumptions about the capabilities and operational concepts for the AAN force.

The strategic issues from the game are presented in terms of these challenges.

STRATEGIC ISSUES PERTAINING TO OPERATIONAL CONCEPTS

Game players conducted military operations according to concepts current in the Army. These applied to some areas in which the Army has no or limited experience, such as space or information warfare. In four major areas, the game results highlighted a number of issues that call into question the assumptions beneath these concepts: combat operations in space, the nature of cyberwar, the effects of "soft" versus "hard" kills, and the tempo of combat operations.

Combat Operations in Space

Today, the surface, oceans, and atmosphere of the earth form a seamless venue of combat operations. Each combat medium has

distinct characteristics, specialized vehicles, a unique body of operational concepts based on experience, its own warriors, and a separate service. Nevertheless, the three media intertwine. Thousands of years of warfare have seen the gradual but inexorable integration of land, naval, and air warfare.

Today, and particularly for a global power like the United States, separated from its vital interests by thousands of miles of ocean, military victory most often requires a successful combination of land, sea, and air warfare. Since the end of the Second World War, U.S. military history has been dominated by the practical and political demands of this challenge. And as the U.S. military enters the last years of the 20th century, the watchword is "jointness," a term that reflects the shared understanding of soldiers, seamen, and airmen that their individual operations are in fact part of a single war plan.

At present, the vacuum beyond the atmosphere but within the earth's gravitational pull—"space"—is not widely understood as part of this seamless venue. The medium has distinct characteristics. It provides a home for satellites supplying communications, intelligence, and targeting to military forces, and it is a medium through which intercontinental and theater ballistic missiles would pass en route to terrestrial targets. But there are no specialized vehicles for combat in space, no body of operational concepts for space warfare, no space warriors, and no space service. Space plays a role in terrestrial warfare: an important supporting role, but ultimately only a supporting one.

The Winter Wargame (WWG) offered a glimpse into a possible future where military operations take place in a pervasive earth-space continuum. Blue's terrestrial military posture depended heavily—and in some observers' view too much so—on space assets. The Blue and Red orders of battle included a wide variety and large number of weapon systems tailored for the space medium, including space-based anti-satellite lasers, satellites carrying anti-satellite kinetic weapons, and direct-ascent anti-satellite weapons. They also included weapons that crossed combat media: ground-based anti-satellite lasers, satellites able to fire depleted uranium rods at terrestrial targets, other satellites used as platforms to insert viruses in terrestrial computers via the radio frequency spectrum, and trans-

atmospheric vehicles able to conduct operations in space or the atmosphere.

Military operations aimed at controlling space dominated the wargame. To deny Blue the "information dominance" enjoyed by its AAN forces, Red initiated a war in space to destroy the satellites Blue relied upon for communications, intelligence, and targeting.[1] Blue retaliated, seeking to destroy both Red's space-based assets and its offensive anti-satellite capability, including space-related facilities located on the ground. Both Red and Blue considered various options—including terrestrial military operations—to deny each other access to third countries' space-related assets.

The combined Space and Information Operations (Space/IO) Special Team briefed the Red and Blue NCA and CINC teams on the space order of battle, space combat outcomes, and the peculiar nature of combat operations in space. This group worked with the Red and Blue CINC teams to develop combat plans that made use of synergies among land, naval, air, and space capabilities.

Issues Pertaining to Combat Operations in Space

The extension of combat operations from earth to space during the WWG raises several issues of strategic importance to defense policymakers and the Army.

1. How heavily should the United States rely on space as the site of military assets that serve as "force multipliers"?

The WWG posited a scenario in which Blue relied almost exclusively on a relatively small set of satellites for communications, intelligence, and targeting. AAN forces particularly depended on these systems to support the "living internet" that enabled Battle Forces to rely on "just in time" logistics and intelligence and positioning information essential to assure the high single-shot kill probabilities

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[1] "Information dominance" refers to the capability to collect, process, and disseminate a continuous flow in formation while exploiting or denying an opponent's ability to do the same.

for advanced precision-guided munitions (PGMs) used by Battle Forces and the other services' "After Next" forces.[2]

As noted above, both Red and Blue had large and varied inventories of anti-satellite weapons. In addition, both Blue and Red were posited as having forces that violated the ABM and outer space treaties, particularly deployed and operational ground- and space-based lasers. But because it was posited as being less technologically sophisticated, Red force effectiveness depended less upon space-based assets.

The Blue forces demonstrated such effectiveness in the Fall Wargames—an effectiveness that derived in no small part from its space-based assets—that Red sought to avoid combat. Before Game Direction told Red it would have to attack Poland or Ukraine, Red sought to avoid war with Blue while actively considering various indirect strategies to neutralize the Battle Force. This approach was motivated by the personal experience of several Red players, including one Red CINC, with the overwhelming superiority of Blue Battle Forces over Red 2020 forces in the Fall Wargames. However, Red also saw Blue's reliance on space assets as an Achilles heel. This vulnerability coupled with Red's lesser dependence on space assets and its vast array of space weapons created a situation in which Red felt compelled to strike Blue in space once Game Direction ordered Red to go to war and combat became inevitable.

The Space Special Team initially assessed Red's massive space attacks on Blue—designed to end the information dominance enjoyed by the Battle Force—as successful. Indeed, assessors told Red that, absent the intervention of Game Direction, they had "won the war." But to keep the war going, the effects of Red's space attacks were degraded. After the first attack, Blue was permitted to retain sufficient satellites to maintain Battle Force capabilities. After the second, Red was told that commercial, foreign, and international satellites had certain capabilities relevant to Blue forces and that Blue could to some extent replace capabilities on space assets with capabilities on manned and unmanned airborne platforms. In both

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[2]By "After Next" forces, we refer to the future (2020 time frame) forces envisioned by the other services.

instances, Blue was able to operate the Battle Force as it had during the Fall Wargames.

Blue was never informed of these Game Direction decisions that permitted the AAN and its sister services' "After Next" forces to operate as though their effectiveness would not have been substantially degraded by Red's attack. However, the Blue NCA team was told and clearly believed that it had suffered a "Pearl Harbor in space" that "set the United States back to 1960." Blue was particularly anguished by Red's space- and ground-based lasers. The Blue NCA was informed that these would have to be destroyed before Blue could deploy the limited number of spare satellites that were necessary to reestablish information dominance.

As a result of their experience, players appeared convinced that if current trends continued into 2020, the effectiveness of U.S. forces would rely too heavily on space-based force multipliers. There was wide consensus that the United States would have to place force multipliers in other media. Considerable interest was expressed in various highly distributed ground- and air-based GPS concepts.

In our view, the WWG raised the important issue of U.S. dependence on space-based assets, but it did not necessarily "prove" that the United States will be overreliant on them—even in a war with a near competitor. Questions concerning the advisability of relying on such assets are not as clear cut as they appeared to the players. At least three points can be raised to suggest that the conclusion of overdependence may not be all that certain.

- Not everyone can mount effective attacks in space. Only a near-peer competitor like Red could plausibly have the space order of battle necessary to cause the extensive damage that occurred in the game.

- Such a power would have to be concerned that the kind of attack posed by Red could set in motion a chain of events leading to intercontinental nuclear war and the destruction of the attacker's own society. What, short of an American threat to absolutely vital interests, could warrant such risks? Red was told to go to war by Game Direction over a matter that neither it, Blue, nor Green considered sufficient to warrant hostilities.

- The effectiveness of Red's attacks depended in no small part on space- and ground-based lasers prohibited by current treaties.

Game participants did not address the cost of terrestrial alternatives to space capabilities, e.g., a ground-based position locating system. If those costs are not trivial, the advisability of reducing U.S. reliance on space must be weighed against the likelihood of such attacks as well as their likely effects. Moreover, the nature of its vulnerabilities in space requires closer examination to determine whether the United States needs to do something different in space or move assets out of space. We conclude that the United States will need to determine the mix of arms control measures, passive defensives, and offensive systems that best serves U.S. interests in space in 2020.

2. Do attacks against U.S. space assets equate to attacks on U.S. territory?

An adversary might be less likely to attack U.S. space assets if it believed that such an attack would be considered equivalent to an attack on U.S. territory and would provoke a similar or, perhaps, a disproportionate response. U.S. policy has always suggested that strikes on the U.S. homeland would draw a devastating retaliation. During WWG play, Blue declaratory policy suggested that space attacks were equivalent to attacks on U.S. territory, but its reaction implied precisely the opposite. The Blue NCA's initial decision not to strike targets in the Red homeland that were specifically related to the space war implied that it did not consider an attack on satellites similar to an attack on Vandenberg Air Force Base or a U.S. city.

The Blue NCA was particularly drawn to the argument that Red's attacks on U.S. satellites invoked Article V of the North Atlantic Treaty, which calls upon NATO members to treat an attack against one member's territory as an attack against all and initiate actions aimed at collective defense. Green was simply unwilling to accept this argument.

3. Are attacks on ground-based space-related assets indicators that nations may be willing to attack the homelands of nuclear powers?

To the best of our knowledge, there is currently no official policy or any effort to review systematically U.S. policy options in these areas.

Red and Blue both discussed whether to attack space-related facilities in each other's homelands with a variety of weapons, including air and missile strikes, special forces, lasers, chaff, and computer viruses. Of particular concern was whether such attacks should or would be considered an attack by a nuclear power on the homeland of another nuclear power, raising the possibility of undesirable escalation, or whether they would not be perceived as an attack on the homeland because the targets were directly related to an ongoing war in space.

Red and Blue reached exactly opposite conclusions. The Red NCA decided not to attack U.S. ground-based space assets because it considered that any attack would constitute a violation of homeland sanctuary. After initially rejecting the proposal to attack space-related facilities in the Red homeland, the Blue NCA eventually relented, but it drew distinctions among various forms of attack. The use of computer viruses inserted by satellites through radio frequencies was considered least escalatory and tried first. Next, the Blue NCA authorized the employment of unmanned airborne vehicles (UAVs) with chaff and lasers. Finally, Blue resorted to more traditional strikes with explosives. In all cases, Blue was driven to attack by the perceived urgent need to eliminate Red's space control capabilities to reconstitute its own space-based force multipliers.

4. What should be the U.S. policy toward the use of private, foreign, and international space assets in time of war?

Private, foreign, and international space assets played important roles in military operations throughout the wargame. Before the outbreak of hostilities, a member of the combined Space/IO Special Team acting as USCINCSPACE during Blue NCA team meetings announced that he had nationalized private Blue space assets including satellites and their ground control, under plans he asserted would be analogous to those for the Civil Reserve Air Fleet (CRAF). The plans that would permit CINCSPACE to make this decision in 2020 would have to have been developed and would require difficult political and economic decisions.

When war broke out, the Blue NCA team discussed the status of communications satellites owned by international bodies. Of particular concern was the use of these systems by Red. There was

much discussion but no resolution of how Red might be denied access by means of the international bodies' governing structures or surreptitiously. But it could be possible to develop international arrangements that could be invoked, similar to those for the nationalization of U.S. assets.

A Green nation, with nonbelligerent status vis-à-vis Red and Blue, maneuvered its intelligence satellites for the specific purpose of assisting Red targeting of Blue forces in the region where Blue and Red forces were engaged in combat. After several warnings, Blue attacked and destroyed the Green satellite.

The Nature of Cyberwar

If space is not yet a medium fully integrated into a seamless web of combat operations, it is at least a place where military planners can dimly perceive its ultimate role if not articulate it in detail. Space is now used as a place for military support and recognized as a place for combat operations. Space technologies are well understood, and many potential weapon systems have proceeded well beyond the "breadboard" stage. The distinct characteristics of the space environment near earth (vacuum, zero-gravity, orbital mechanics) have been modeled, providing opportunities to begin the development of operational concepts. Military analysts and operators recognize the emerging earth-space continuum and its implications for an expanded view of combined arms operations and the concept of jointness. Space presents challenges for military planners, but it is understood to be an extension of the "real" world.

The potential for conflict in outer space does not undermine an assumption of today that combat operations take place on actual terrain. However, the emergence of a "cyberspace," the electronic web of computers and their channels of communication through wires and the electromagnetic spectrum, does challenge the assumption. Military planners are only beginning to perceive this "virtual reality" as a new combat environment, with its own operating conditions and ways of inflicting damage, weapon systems, concepts of operations, warriors, and combat arms. They are far from knowing much more than the fact that cyberwar will have some effect on future war, and that war will have some influence on cyberspace.

The WWG provided an opportunity to think about cyberspace, cyberwar, the relationship between war in the virtual and real worlds, and the implications for the Army, Navy, and Air Force. But considerably more work and analysis needs to be done.

The combined Space/IO Special Team posited information warfare orders of battle for Blue and Red that included computer viruses—the peacetime and prehostilities covert placement of "trap doors" and destructive or manipulative programs into adversary and third-party computer systems ready for activation in times of war.

A distinct group from the Space/IO Special Team briefed the Red and Blue NCAs on cyberwar options. The Space/IO Special Team claimed that Blue and Red had the ability to freeze computers and corrupt data bases, to shut down power systems, to selectively damage or destroy vehicles in transportation systems, to limit collateral damage to friendly and nonbelligerent systems tied to an adversary's computer network, and to predict and assess the effects of cyberwar operations with some confidence. They suggested that Blue had the capacity to conduct cyberwar operations with plausible deniability and to detect attacks against its information infrastructure.

Members of the Space/IO Special Team worked with members of the Blue and Red CINC teams to integrate cyberwar and traditional combat operations. Based on their best military judgment of cyberwar in 2020, the Space/IO Special Team assessed the direct and collateral effects of the operations they earlier proposed to the Red and Blue NCAs. Blue and Red NCAs, and even a country represented by the Green team, seriously discussed and debated strategic and tactical cyberwar operations.

Issues Pertaining to the Nature of Cyberwar

1. Are offensive cyberwar operations the "last steps" taken to prevent war, or are they the "first shots" in a war?

Before the outbreak of hostilities in Ukraine, the Blue NCA team considered cyber operations against Red, such as:

- Freezing Red overseas financial assets by surreptitiously manipulating offshore banks' information management systems.

- Temporarily shutting down elements of the Red economy that relied on computer systems, including stock markets, financial institutions, and rail systems, surreptitiously or in combination with a public or private Presidential statement that Red "cease and desist" in Ukraine.

- Placing misleading information in Red intelligence-gathering systems.

- Inserting computer viruses that could be activated in time of war in Red computer systems.

Discussions in the Blue NCA team suggested that some of these operations would be carried out by the CIA, requiring a Presidential "Finding" and the notification of Congress. Others might be carried out by some element of DoD and carry a warlike connotation raising issues related to the War Powers Act. Some cyber operations were discussed as adjuncts to economic sanctions that might be considered part of an effort to deal with the crisis by means short of war. Others were clearly intended to improve Blue's chances for a quick military victory should war occur.

Members of the Space/IO Special Team briefing Blue suggested that Red would not be able to trace the effects of cyber operations back to Blue, but some Blue NCA team members were skeptical. Blue NCA players could not be sure how the Red team would react if it discovered that Blue was behind such operations. Moreover, many Blue players thought that Blue would consider similar Red operations to be something akin to acts of war and would believe Red was behind any disruption of Blue's computer systems, even if Blue could not prove Red was the culprit and even if Blue did not publicly identify Red as the origin of such attacks.

The Blue NCA never explicitly authorized prehostility cyber operations. Later in the game, however, members of the Space/IO Special Team, briefing the Blue NCA team on cyberwar options after the outbreak of hostilities, implied that viruses had been placed in Red computer systems before the war began.

2. How should the U.S. government be organized to wage strategic cyberwar?

The Blue President asked the Space/IO Special Team to brief him on how the United States government (USG) should be organized to conduct cyber operations designed to further national objectives in times of war. Of particular concern to him were:

- The possibility that the CIA and DoD were developing separate and overlapping war plans without coordinating their efforts.

- The implications for "War Powers" and "Findings" policies of CIA coordination with Special Forces Command on covert activities involving cyber operations.

- The relationship of cyber operations to the activities of other USG agencies and the private sector.

- The need for a single locus of command for offensive strategic cyberwar operations such as the proposed actions against the Red stock market, banking system, and rail network.

- The need to provide the NCA with tactical warning and attack assessment of cyber attacks against Blue, including attacks on private as well as government components of the information infrastructure.

To the best of our knowledge, although such groups as the Defense Science Board have examined the challenges of cyberwar, the USG currently has no policy for dealing with these issues.

3. What constitutes timely, reliable, and unambiguous warning of a cyber attack?

Based on its briefings, the Space/IO Special Team appeared to believe:

- That Blue had the capacity to provide the NCA with some degree of tactical warning and attack assessment (TW/AA) of cyber attacks.

- That Red would not be able to "prove" Blue conducted cyber attacks on Red.

As with most discussion of cyberwar issues, participants merely asserted these capabilities. There was no substantive discussion of:

- The characteristics of warning indicators.

- How to determine the origin and intent of cyber attacks.

- Who needed such information, how quickly, and in order to do what.

- Who should provide such TW/AA information and under what form of organization.

These issues require serious consideration at the national level. To the best of our knowledge, analysis in this area remains in a formative stage.

4. How should offensive cyberwar operations be integrated into U.S. war plans?

Blue discussed several military operations involving the use of offensive cyberwar operations alone or in combination with conventional military forces. Early in the space war, Blue was prepared to use only cyberwar operations against the Red ground-based laser (GBL) as a way to avoid attacking Red territory with conventional forces or munitions while achieving the military objective of reestablishing its space-based capabilities. Specifically, the Blue NCA authorized the insertion of a computer virus into the Red GBL computer system from a Blue satellite via radio signal. The Space/IO Special Team judged that such an operation would have a transient effect of a few hours. This limited effect forced Blue to resort to more intrusive means of attack, first including lasers and chaff from stealthy UAVs and, later, hypervelocity rods fired from Blue space platforms.

Blue discussed using cyberwar operations to derail selected Red trains carrying forces and supplies to the front, as part of a general plan to interdict Red during the war in Ukraine. The NCA expressed concern that the operation might derail passenger trains, killing Red civilians, or appear to violate the homeland sanctuary, requiring Red to respond to Blue's "escalation" in kind.

Particularly as a result of the assessment of the effects of Blue's cyberwar operations against the Red GBL, many WWG participants concluded that cyberwar operations alone could not have significant military effect. To many, these game events suggested that cyber at-

tacks are at best precursor events that need to be quickly followed by "hard kills" with traditional weapons.

5. What are the direct and collateral effects of cyberwar operations?

Although the Blue NCA team discussed a wide variety of strategic cyberwar operations, it proved extremely reluctant to authorize them, particularly before the outbreak of a traditional war. Blue NCA team members did not understand cyberwar as well as they did traditional warfare. It became clear in the course of discussion that members of the Space/IO Special Team were speculating about both the direct and the collateral damage associated with proposals to temporarily stop trading on a Red stock exchange, to selectively derail Red military supply trains, or to interfere with Red assets in the private banks of third countries. Blue NCA players seemed to believe there were great uncertainties about whether a proposed cyber operation would work and whether it would in some way seriously damage computer networks of importance to Blue and particularly to the internetted global economy on which Blue relied. Consequently, while the members of the Blue NCA team felt well prepared to tailor the use of traditional forces to meet national political objectives, they appeared to have little confidence in their ability to tailor the use of cyber force.

It is our sense that little analytical work has been done about the direct and collateral effects of cyberwar operations in the 1990s, let alone in 2020, when most experts expect the world to be more intensively and extensively networked.

The Effect of Soft Kills

For the most part, today's military planners rely on explosive blast and shock to damage and destroy enemy targets in the pursuit of victory on the battlefield. But other types of destruction are possible. In the nuclear arena, planners and weapons designers have long understood that nuclear detonations create strong electromagnetic, neutron, and microwave pulses that can destroy systems, particularly if detonated at high altitude, and they have discussed the possibility of building weapons that maximize such effects.

The Defense Department and services have had "nonlethal technology" programs under way for several years, exploring the military possibilities of sound, chemical, and other technologies that might disrupt combat activities without necessarily killing the combatants. The U.S. military has begun to take seriously the weaponization of such technologies in the last several years, but the program remains relatively small and somewhat peripheral to the DoD's plans for weapon system acquisition.

Much has been written about the use of computer viruses and other software weapons against an adversary's computer systems. The U.S. defense community has become aware of the possibilities and the Defense Department and services have begun to organize themselves to defend against deliberate cyber attacks and computer hackers. But as discussed above, U.S. thinking about cyberwar is in its infancy.

Other weapons include chemical and biological agents. Although the United States has eschewed these weapons, other countries are not as fastidious, most notably Iraq.

The WWG provided an opportunity to explore issues related to the use of weapons that employ mechanisms other than blast and shock and issues related to the effects of "soft kills" on military planning and national strategy. Red and Blue orders of battle included a range of weapons with "soft kill" effects including cyber weapons aimed at the programs of an adversary's computer systems, lasers, and nonlethal chemicals. Both teams contemplated and used these nontraditional weapons, either by themselves or in combination with traditional weapons.

Issues Pertaining to the Effect of Soft Kills

1. Can "soft kills" have persistent effects, or must they be followed up with explosive "hard kills"?

Both Red and Blue contemplated using "soft kill" weapons in stand-alone operations aimed at achieving specific military objectives. Red employed nonlethal chemicals against Blue AAN forces at their points of embarkation in CONUS to delay or even stop their deployment to Europe, thus giving Red an opportunity to present Blue with

a *fait accompli* in Ukraine. The assessment team deemed the attack unsuccessful. Blue used cyberwar techniques to disable the Red GBL, a precondition for reconstituting Blue space-based capabilities. The attack was assessed by the Space Special Team to have disabled the GBL for a few hours. Ultimately Blue destroyed the GBL with kinetic weapons, which do not rely on traditional explosives but nevertheless produce damage by means of blast and shock.

As a result of these adjudication decisions in the assessment process, participants in the wargame left with the impression that "soft kill" weapons are at best an adjunct to traditional weapons relying on blast and shock. However, the likely effects of weapons using "soft kill" damage mechanisms in 2020 are far from clear. Little effort was made during adjudication to seriously consider direct and collateral effects, or the role of defenses against cyber, laser, and chemical attacks. The Red and Blue teams lacked specialized expertise in soft-kill weapons. The Space/IO Special Team provided expertise on cyberwar techniques and the use of lasers, but as noted above, advice to teams and assessors was based largely on assertion rather than analysis. And no Special Teams had significant expertise in non-lethal chemicals.

2. How vulnerable are AAN forces to "soft kills"?

Blue's Battle Forces relied heavily on microelectronics. They formed the brain of all PGMs' guidance systems. Individual combat vehicles contained computers that provided target solutions, allocated weapons, and monitored the vehicle's supply of munitions, food, fuel, and other stores. These systems were tied to a "living internet" linked to other combat vehicles in the force and reaching back to a "just-in-time" system of logistics delivery in rear areas and CONUS.

These capabilities were necessary to the Battle Force's high level of combat effectiveness. Without them, the force was probably highly vulnerable, less lethal, less maneuverable, and more difficult to command and control. No description of the Battle Force we know of claimed that it was hardened against electromagnetic pulse (EMP), and the current trend in weapon system development is not to harden against such effects due to the relatively high costs involved.

The high-altitude weapons Red launched had a marginal effect. Red launched 18 high-altitude weapons over Japan, two of which were nuclear of unspecified yield. The objective was to produce EMP effects against Blue forces in the region, including the Blue Battle Force in Korea. Neither of the nuclear weapons detonated, and only two of the others did. The effects of exoatmospheric nuclear detonations, regardless of weapon yield, extend from approximately 600 to over 1,000 miles depending upon the exact altitude of the detonation. In either case, this would have been sufficient to cause serious EMP effects to the Battle Force stationed in Korea, severely reducing its effectiveness—in particular, its ability to self-deploy. The nonnuclear detonations were reported to the teams as having little effect on the Battle Force in Korea, and therefore it was allowed to self-deploy on schedule to participate in military operations against Pink.

The lack of Red success notwithstanding, Battle Force manpower requirements assume that microelectronics reduce the need for humans to execute functions ranging from assessments of unit logistics requirements to battlefield situation assessment and firing solutions. Without the benefit of microelectronics, the ability to carry out these functions becomes more problematic. Personnel would lack ready access to the information necessary to make assessments and the algorithms required for solutions. The result would be a serious deterioration of command and control as people became overwhelmed.

Other weapons employing "soft kill" techniques could be effective. Ground vehicles in the Battle Force move on tracks or tires. During the game, Red overtly employed nonlethal chemical in CONUS locations where Battle Forces were assembling for embarkation and deployment to Europe. These chemicals would disintegrate tires, track pads, and perhaps other plastic or rubber parts. The attack was judged to have no effect on AAN forces or Blue's deployment timetable.

3. Are "soft kills" less escalatory than other forms of attack?

Because they do not "blow up" their targets, weapons involving "soft kill" damage mechanisms offer the possibility of attacks that fulfill military objectives without killing people, destroying things of value, or damaging unrelated facilities in the vicinity of the intended target.

The Blue NCA's discussions about the use of "soft kill" options suggest that Blue players regarded such attacks as less escalatory than attacks by more conventional munitions. When considering options for retaliating against Red's attack on Blue's space assets, the Blue President initially preferred cyber weapons over traditional weapons. He clearly saw the former as offering less intrusive means of entering the Red homeland and negating Red's GBL. A "soft kill" via cyberspace was deemed a less provocative breach of homeland sanctuary than a hard kill with a conventionally armed warhead carried by a missile or aircraft.

Red held similar discussions about attacks on Blue space-related ground facilities in CONUS. Red deemed that such attacks violated the homeland sanctuary, whatever the damage mechanism and however the weapon was delivered. Consequently, Red decided not to be the first to initiate attacks on CONUS space facilities.

The escalatory potential of soft kill operations is an issue worthy of serious analysis, especially if U.S. perceptions are likely to differ from those of potential adversaries.

The Tempo of Combat Operations

Today, a comprehensive review of civil-military relations would be incomplete without a discussion of the ways that modern communications technology allows political leaders to manage military activities intensively and the implications of this fact for combat operations. However, despite the capacity for civilian control or interference offered by technology, the timeline of warfare—from mobilization and deployment, through the movement of forces on the ground, and the phasing of battles into campaigns and of campaigns leading to the conclusion of wars—has generally fallen well within the timelines political leaders require to formulate national policies on the aims and conduct of war, build and manage international coalitions, and negotiate the termination of hostilities.

The possible exception to the above statement is strategic nuclear war. In this instance, the technology supporting military operations outstrips the timelines of political decision. During the Cold War, a Soviet SLBM launched off the eastern seaboard of the United States would have given a President less than 10 minutes to decide whether

to order a limited number of response options contained in the Single Integrated Operational Plan or leave that decision to a successor. The flight time of Soviet ICBMs allowed the United States less than 45 minutes to execute what might well turn out to be a single retaliatory response. The damage done by Soviet nuclear strikes might conceivably deny the United States the capacity to retaliate with weapons other than SLBMs if national leaders chose to decide on a response only after "riding out" the attack, and would probably lead to an incoherent response. But the damage done by even an incoherent U.S. retaliation would have decimated the Soviet Union and destroyed large portions of its structures for controlling war.

A Soviet nuclear attack would have left the fate of the United States, indeed the world, solely in the hands of the President. He would—at best—have perhaps minutes to confer with his closest advisors, and literally no time for consultation or even communication with the Congress, the people, allies, or even the Soviets. The requirement to "use it or lose it" would have left no room for a political leader's well-honed techniques of crisis management.

The Soviet leadership faced the same problem, and the symmetry provided a powerful incentive for the two superpowers to avoid direct confrontation, engage in measures designed to control the risks and consequences of nuclear war, and enter into vastly expensive efforts to buy their NCAs and successors some ability to control the conduct of war, including limited nuclear options, effective means of nuclear attack assessment as well as tactical warning, continuity of operations, and ultimately strategic defenses.

During the WWG, Blue and Red leaders faced a similar situation. Technology allowed conventional military operations to outpace political decision time during the space and ground wars. Intercepting a missile during its boost phase requires a decision to fire within several minutes of launch. The destructive power of space- and ground-based lasers makes it conceivable that the side suffering the first blow in space will lose all its space assets, be unable to reconstitute its space-based capabilities, and have no effective means of space warfare. During the wargame, the member of the Space/IO Special Team acting as USCINCSPACE on the Blue NCA team repeatedly requested the right to initiate offensive military operations in space based on his judgment that a Red space attack was impending. The

Blue President refused those requests, because (in the words of one RAND observer) "John Wayne does not throw the first punch," and because the President would not delegate the political decision to go to war with a power capable of destroying the United States to an unelected official, whatever the risk. The result was the aforementioned "Pearl Harbor in space."

During the war in Ukraine, the capabilities of the AAN and the other services' technologically advanced "After Next" forces also created circumstances that taxed the political decision time of Blue and of the Blue/Green alliance in Europe. Blue forces moved into Europe very quickly and conducted offensive operations almost immediately on their arrival. Several factors—the speed with which the AAN force prepared for battle, redeployed in theater, engaged large enemy formations, and moved through Ukraine; the Achilles heel of the AAN and its service siblings, dependence on space; and the very deep fires capabilities of Red and Blue—created enormous pressures for rapid escalation.

The crisis quickly expanded from threatening Red statements and actions against Ukraine to an invasion of Ukraine, followed in days by a major Red attack on Blue space-based assets, then a war involving Blue, Red, and Green forces across Central and Eastern Europe and the Mediterranean and Baltic Seas, fought deep into Red territory as well as in space. Driven by the relentless military logic of an expanding war zone, Blue's political objectives changed from a successful noncombatant evacuation (NEO), to the partition of Ukraine, to the liberation of Ukraine, to the containment of a Eurasian war. This process outpaced Blue/Green consultations with Red, strained Blue/Green consensus on the nature of the threat and war aims, and destroyed allied solidarity. Game Direction had to override Green's decisions to initiate its own NEO in Ukraine, to deny Blue the use of its airfields for offensive operations against Red forces, and not to participate in allied air operations against Red.

Issues Pertaining to the Tempo of Combat Operations

1. How should the NCA deal with delegations of authority and requests to initiate hostilities in situations where military success may depend on striking first?

Blue players representing regional CINCs and the Chairman of the Joint Chiefs of Staff (CJCS) asked the Blue President to delegate the authority to initiate or escalate hostilities in five areas: space, cyberspace, ground-based Red space assets, submarines, and Red targets in the east. In all cases, the President refused, with important and sometimes devastating effects on the U.S. war effort. Illustrations follow.

- A member of the Space/IO Special Team playing USCINCSPACE for the purposes of Blue NCA team meetings requested the authority to initiate attacks on Red's offensive space-based space control capabilities and particularly the space-based laser—in the event of imminent hostilities. The refusal to delegate authority to USCINCSPACE resulted in the "Pearl Harbor in space," which set U.S. space-based capabilities "back to the 1960s."

- Before the outbreak of a Red-Blue war in Ukraine, members of the Space/IO Special Team, together with the Blue CJCS, asked the Blue President to authorize the initiation of cyber operations against Red banking, stock market, and rail systems, in part on the theory that "trap doors" might close and that options to insert computer viruses that would be activated during hostilities should be initiated beforehand. Cyberwar operations against Red were permitted only after Red's space attack—and only to degrade Red's space control capabilities.

- The Blue CJCS repeatedly urged the President to authorize conventional attacks on homeland targets in Red associated with the war in space, the supply of Red forces in Ukraine, and air operations and very deep fires against Red forces in Ukraine. Conventional attacks on space control assets in the Red homeland were permitted only after "soft kill" operations failed and Blue's need to reconstitute space capabilities became desperate. Conventional attacks on Red homeland facilities related to the war in Ukraine were authorized grudgingly by the President after military players implied that it was immoral to allow Red to conduct strikes from the homeland that would cause the deaths of American service men and women.

- The Blue CINC West requested the authority to sink Red submarines off the U.S. east coast if they showed signs of preparation for hostile action against Blue. Blue CINC West was given

the authority to attack Red submarines if they showed signs of hostile intent only after the President became concerned that Red's overall pattern of actions suggested that escalation to nuclear war was increasingly plausible.

- The Blue CINC East requested the authority to strike a broad range of Red targets in the Far East in the event that war broke out in Ukraine. In all cases, the Blue President refused the request to bolster an escalatory "fire break" unless and until the military effect of maintaining the break became intolerable. Red-Blue hostilities were terminated by Game Direction with Blue CINC East never given the authority to strike Red targets.

In this game, sometimes a high price was paid for the Blue President's decisions not to delegate authority or initiate certain types of warfare. But participants did not disagree with his repeated assertions that U.S. Presidents would not delegate what they would inevitably consider to be political decisions. The implication for many participants was that future Presidents need to become "better educated" so they would make the militarily correct decision.

An alternative implication, which was not discussed during the wargame, is that U.S. forces and military capabilities should be designed with this political fact in mind. Again, there may be something to be learned from our operation of strategic nuclear forces in the Cold War. The ability to conduct a devastating second strike has been an important requirement of U.S. strategic nuclear forces. The U.S. nuclear posture was designed so that a President could conduct an effective retaliation against a surprise attack—regardless of the alert levels. Given the possibility that "first strike" instabilities could emerge from the interaction of near-peer competitors' conventional forces in 2020, a secure second strike capability might be a requirement for the AAN as well.

2. How can the United States foster "coalitions of the willing" that exploit AAN capabilities?

One advantage of the AAN is its strategic and intratheater mobility. AAN forces can move quickly, but during the WWG, the initial basing of most Battle Forces in CONUS meant that it had to move fast if it was to halt Red in Ukraine. This time-urgent decision was not en-

tirely Blue's, however. The agreement of Green allies was required to support the reception and onward movement of AAN forces deployed to Europe. To secure this agreement, Blue needed to convince Green of its plans and policies vis-à-vis Ukraine. In fact, Blue failed to obtain Green's agreement on most matters in the Ukraine war, including the ultimate use of AAN forces.

Game Direction's decisions that Blue could overfly Green en route to targets in Red, use Green airfields for such attacks, use Blue bases in Green to support operations in Ukraine, and include Green air assets in attacks on Red despite Green's decisions to the contrary, obscured the actual importance of allies to AAN operations. Without overflight rights, the use of air fields and other facilities, and the participation of Green air forces, it is doubtful that the AAN could have arrived in theater in sufficient time with sufficient force to prevent Red from occupying Ukraine.

Serious attention needs to be paid to the role of U.S. allies in support of operations involving AAN forces. Without their cooperation, the AAN force may not pose a credible threat.

3. How should AAN forces be integrated with Force XXI and other less technologically advanced forces?

During the WWG, Blue's AAN forces deployed to the field and operated at a pace far beyond the capacity of Green ground forces and Blue's Force XXI units. As a consequence, the role of less advanced forces would have been limited to "mopping up" the Ukraine war. Blue Force XXI units could have fought alongside allied units, but they would not have arrived in theater in time to halt the Red advance. AAN forces arrived quickly, but the local Ukrainian forces were only used when the Blue Battle Force was unable to eject Red forces from Kiev.

Had Green agreed to participate in the war, it probably still would not have had ground forces in country when Blue AAN forces began operating in Ukraine. In fact, Blue CINC West planners demonstrated little interest in either Green ground forces or Force XXI units. This fact stands out in stark contrast with Blue CINC West's keen interest in Green and U.S. air forces and Game Direction's decision to override Green's prohibition on the use of its air forces.

The historical preference of U.S. political leaders toward the defense of allies has always tended to emphasize U.S. air and sea power bolstering local allies' defense on the ground. It is U.S. allies that have insisted on a significant U.S. ground presence. Blue's decision to "go it alone" on the ground in Ukraine during the Winter Wargame turned this preference on its head, and needs to be contrasted with the U.S. government's adamant unwillingness to shoulder sole responsibility for ground operations in the former Yugoslavia.

Which experience represents the more likely future? An assumption that U.S. forces will not participate in a major Eurasian ground war without local allies' ground forces fighting alongside is at least as reasonable as the WWG's opposite outcome. Given the strength of the first assumption, AAN planners need to pay greater attention to means of integrating allied ground forces into AAN operations.

4. How sustainable are AAN operations?

Although a Logistics, Sustainability, and Deployment Special Team was present during the WWG, these functions were not fully considered in the assessment process, and they therefore cannot be said to have been played in the game. Unlike Red, the Blue force structure was unconstrained by assumptions about the future history of the Blue economy or the portion of GNP devoted to national defense in the years before the 2020 war. As a result, while the Red force structure and munitions inventories developed by Science Applications International Corporation (SAIC) represented the results of some assessment about the relative contribution of different types of military capabilities within a given budget, the Blue force structure constituted a simple compilation by WWG developers of inputs developed by game participants from each of the services. These inputs consisted of service representatives' proposals for a 2020 force—proposals that did not generally follow from any analysis of budget constraints and had minimum standing within the proponent's service. Generally, the force was constrained by projected end strength (470,000) for the Army.

The deployment of the CONUS-based AAN force to Europe in one day was based on what the Sustainability and Deployment Special Team considered to be some unrealistic assumptions about the force's self-deployability. Adjudicators assumed that a single AAN

Battle Force could self-deploy from the CONUS in one day, provided it had its organic aircraft and half the aircraft from another Battle Force. The claim was made that this could be accomplished by "island-hopping" to Europe. This speedy deployment of the force to Europe was essential to prevent what otherwise would have been Red's complete occupation of Ukraine. Absent these assumptions, Blue might never have engaged in combat operations against Red in Ukraine, and Red might conceivably have defeated or stalemated Blue, despite the introduction of some AAN forces.

To the best of our knowledge Blue never faced logistical or sustainment constraints. However, based on other aspects of game play, it is reasonable to assume that such constraints would have applied. Of particular concern are PGM supplies. The war in Ukraine, including deep strikes into Red, used many hundreds of PGMs daily. It was generally understood that, absent the aforementioned interventions of Game Direction to reduce the impact of Red strikes on Blue space assets, the loss of GPS would have substantially degraded the effectiveness of Blue's PGMs. But the assessment of conventional warfare did not incorporate this factor. If this effect had been taken into account, the demands on Blue's PGM stocks might well have been even more substantial.

The AAN and the "After Next" forces of its sister services intensively and extensively use the most advanced technologies. These forces will require special production facilities and specialized personnel. The expense of these forces is at least as likely to yield a relatively small force structure as the huge one posited in the game. Given this fact and the likely effects of the degradation of PGM effectiveness, the intensity of combat operations, and the tendency of the war to expand and escalate rapidly as experienced in the WWG, the sustainablity of AAN operations is an issue deserving detailed analysis.

ASSUMPTIONS ABOUT THE ARMY AFTER NEXT FORCE

The developers of the AAN future force and its concept of operations have stated repeatedly that the AAN force is not a prediction of what will be, but rather it is a "placeholder" that encompasses the technologies that are likely to be available in the 2020 timeframe. It was created because a future force was required to study future warfare. Nevertheless, several assumptions were made about its capabilities

that the WWG called into question. These assumptions are divided into five areas: force structure, capability, roles, mission, and operational concept.

Force Structure Assumptions

Although those involved in the development of AAN concepts and the description of the Battle Forces contained in Blue's order of battle for the WWG never stated so, we believe it is reasonable to assume that they believed the force would contribute to deterrence. The WWG revealed a more complicated story.

It is quite clear that the capability of the AAN was a factor in discouraging Red from going to war. Several Red players also played Red in the Fall Wargame at Fort Leavenworth sponsored by TRADOC's Analysis Command (TRAC) to develop an understanding of Battle Force and Battle Unit operations, as well as the decision tables that the assessment teams used in their adjudication of CINC teams' decisions during the WWG. The results of the several vignettes played in the FWG were overwhelmingly unfavorable to Red. Of particular importance to the Red players in these fall games was the "information dominance" uniformly enjoyed by Blue, an advantage that allowed Blue Battle Units to appear "almost magically" in places and at times least convenient to Red.

When they arrived at the WWG as players on the Red CINC teams, this group had a healthy respect for the AAN, a respect bordering on awe. This assessment was made clear to the Red NCA team, and the Red President accepted it. Indeed, those playing the Red military exhibited an almost bipolar psychology in their consideration of war with Blue; they either wanted to avoid it entirely or escalate massively and early to take the AAN out of play. Early in the game, well before the outbreak of hostilities, Red military planners—who knew that wargames are held to play war—considered the massive preemptive use of nuclear, chemical, and space weapons to destroy Blue's AAN.

When Game Direction informed Red that it would have to attack Poland or Ukraine, Red players knew the war was on. They chose not to forgo the advantages offered by a "knockout punch" against Blue, knowing they would otherwise face what all perceived to be in-

evitable military defeat at the hands of the AAN. For this reason, Red resorted early and often to massive and highly escalatory attacks, including several large space attacks, the use of chemicals against AAN forces in CONUS, and the use of nuclear weapons to produce high-altitude electromagnetic pulse effects.

Although Red's attacks were, in a sense, compelled by Game Direction and influenced by Red players' understanding of the purpose of a wargame, we believe they have implications for crisis stability.

- Where an adversary perceives a gross disparity in military capability favoring the United States, that perception should tend to discourage it from going to war against the United States.

- However, a technologically inferior adversary who concludes war is inevitable will be under strong pressure to find and exploit vulnerabilities in the U.S. force structure rather than directly confront U.S. strengths. Red's willingness to engage in a space war that robbed both sides of space-based capabilities suggests that options that have the effect of placing the adversary and the United States on a more even footing, especially in areas where the United States has a substantial advantage, may be particularly attractive.

- The situation may differ for a more evenly matched opponent. Only a near-peer competitor is likely to have the kind of capabilities Red possessed in the WWG, which would be necessary to threaten U.S. space-based capabilities. The United States and a near-peer competitor are unlikely to engage in wars that threaten each other's vital interests to the point where either power would consider the kind of attacks undertaken by Red in the WWG.

- Possibly, the effectiveness of U.S. forces will depend far more on the information infrastructure than will the forces of many of its potential adversaries. At this time, it also appears possible that the cost and other challenges of developing cyberwar capabilities will be within their capacity circa 2020.

In addition, the inherent capabilities of the Blue After Next forces created a pressure for their use, with uniformly escalatory consequences during the WWG. For example, the speed and reach of AAN forces and the "After Next" equivalents proposed by the Army's sister

services meant that they were the forces that could get to the trouble spot the fastest. However, their wide range of capabilities also made it extremely difficult for Blue to limit the intensity and geographic scope of the war that began in Ukraine.

- AAN forces with capabilities highly threatening to Red were deployed to Ukraine because they could get there first, despite their limited utility in a NEO.

- Because Blue Navy "After Next" forces in the Baltic and the Mediterranean could be employed, they were employed.

- Because assets in space were integral to Blue's operations, space quickly became part of the war.

- Because facilities in the Red homeland associated with Red operations in Ukraine and space could be targeted, the Blue NCA found it difficult to deny the military the right to attack those facilities.

The individual and combined result of these capabilities and pressures for use was an incredibly rapid escalation and expansion of the war. In retrospect, the Blue forces posited for the WWG created the same kind of "hair trigger" in the realm of conventional war that once concerned arms control specialists dealing with the interaction of U.S. and Soviet nuclear forces throughout the Cold War. To some extent, this reaction was generated by the game. That said, however, it appears that policymakers need to consider carefully the type of forces used to respond to crises.

Capability Assumptions

The principal mission of AAN forces appears to be the rapid and decisive destruction of enemy ground formations. The capabilities key to this mission include light, fast vehicles that support unprecedented strategic, intratheater, and tactical mobility; satellite and airborne communications, surveillance, and targeting data that offer "information dominance"; stealth; a range of PGMs whose lethality hinges on continuous updates provided by GPS; and internetted computers that provide firing solutions for many targets simultaneously and support efficient weapons allocation. These capabilities allow AAN forces to engage far larger formations well beyond the

range of enemy weapons with incredible speed, efficiency, and accuracy. During the WWG, we observed that the capabilities of the Battle Force overlapped with those of the other services' "After Next" forces. This is not necessarily an undesirable result, unless one wishes to demonstrate that the Battle Force has unique combat capabilities.

Role Assumptions

There is perhaps no role more closely tied to the essence of the Army than holding ground. However, the AAN Battle Force designed for the WWG could not fulfill this traditional Army role. Indeed, to obtain their high mobility, Battle Forces consisted of a small number of units that lacked significant armored protection. The Fall Wargames revealed that Red was most likely to inflict casualties on AAN forces when it could fix them and engage in close combat, i.e., when it could stop Battle Forces from maneuvering and instead force them into a static defense. These wargames never presented Blue a situation that made holding ground necessary, but this does not mean that some future conflict might not place a premium on that role, e.g., defending a major city of an ally. It is possible that less modernized (Force XXI) units could support the Army's role in holding ground, following behind and prepared to mop up after the Battle Force. During the WWG, however, Blue AAN and Marine "After Next" ground forces were far ahead of the nearest available Force XXI–type units and operated independently of them.

Mission Assumptions

The AAN Battle Force's mission was not assumed to include military operations in urban terrain (MOUT). Indeed, the characteristics of urban warfare are diametrically opposed to the open terrain where the small, highly mobile, dispersed Battle Units were designed to operate. During the WWG, AAN Battle Forces were in fact called upon to conduct MOUT. The rapid deployability of the AAN from CONUS to the theater—and within the theater—convinced the President to use the AAN Battle Force in a rapidly evolving crisis. But the ability to arrive early is obviously not enough; forces must have the capability to perform the assigned mission.

Operations Assumptions

During the Cold War, The U.S. Army's principal role in support of U.S. national security policy was one of "forward deployment." Substantial U.S. ground forces and hundreds of thousands of American soldiers were placed overseas to prevent a quick grab of allied territory. The basic strategy was to buy time for national mobilization, reinforcement, and global war. In the post–Cold War era, the Army has provided a much smaller "forward presence" on allied soil, in recognition of the reduced threat, changing allied attitudes, the cost of overseas basing, the high level of uncertainty facing contingency planners, and the downsizing of the Army. The planning leading up to the WWG suggests an assumption that the trend toward centralizing U.S. ground forces in CONUS will continue.

The Battle Forces posited for the WWG gave the U.S. Army of 2020 "power projection" attributes enjoyed by air power today. Today, it takes weeks to move the firepower of a division from CONUS to Europe; to move the equivalent firepower in the form of tactical air takes days. In 2020, a Battle Force will have strategic mobility comparable to that of tactical air. The capability is consistent with the current approach of centralizing ground forces in CONUS, where they are well positioned for deployment to Europe, the Persian Gulf, or the Far East.

WWG play called this approach into question, particularly in scenarios where the United States must respond quickly to the actions of a near-peer competitor operating close to its homeland. Although by 2020 Blue's forces could deploy significantly faster than they can today, Red's relatively modest improvements in deployability, combined with its proximity to Ukraine, gave Red leaders a credible "quick grab" option. Absent an optimistic assumption about AAN Battle Force deployment timelines from CONUS, Blue might not have arrived quickly enough and with sufficient ground forces to prevail in Ukraine.

EMBEDDING THE WARGAMES IN BROADER ANALYSIS

The annual wargame series (Winter and Summer) is part of an ongoing process of examining warfare in 2020 and beyond. Several other activities are in progress that are designed to explore special aspects of future combat. This chapter suggests how all these activities might be integrated to achieve a more coherent process.

The role of the AAN study process is to generate and explore issues associated with future warfare with an eye to developing force structures. The ultimate goal of the AAN study process, however, is to design and field an Army force and develop operational concepts for war in the 2025 time frame. Central to the AAN process is an understanding of the nature of combat in the 2025 time frame that is embodied in the AAN objectives (see page 1). The issues that emerge from the games provide a rich set of study questions for further analysis.

Some of the more important issues will be used by TRADOC to design force structure, operational concepts, and scenarios for subsequent games. TRADOC also conducts a series of seminars, studies, and so forth that focus on the future technologies, military art, human and organizational issues, and the future geostrategic setting. These inform the scenario, force structures, and operational concepts. However, the coupling among all these activities has been rather weak in that the activities appear to be conducted independent of each other.

Needed is a strategy that embeds the annual AAN wargames into the annual AAN process. AAN wargame results and the AAN process must have external credibility if they are to influence policy—espe-

cially with respect to the allocation of scarce resources to support Army programs. The key to credible results is a thoughtfully executed and broadly supported AAN study program. The loose coupling between the annual wargame series and other AAN activities should be replaced with a stronger relationship in which AAN activities support—and are supported by—the annual AAN wargames.

One way to make this happen is to develop a series of activities—each informing one or more of the main themes in the June 1996 Report to the Chief of Staff:[1]

- **The geostrategic setting.** The influence on warfighting of the future international environment, the rate of political change, and the effects of the information revolution provide the backdrop for the development of alternative scenarios that might be refined for use in the annual AAN wargames.

- **Technology and trends.** Information and precision-guided munitions will continue to be the key force multipliers through the first half of the next century. However, we will witness an increasing use of space to control the tactical and strategic battlefield. We should also see a parallel increase in the use of low-observable, unmanned aircraft to perform intelligence, surveillance and reconnaissance missions. The important technological questions in this environment center on the command and control of forces and weapon systems.

- **Evolution in military art.** Future wars will involve joint operations, with increasing importance being placed on operational-level combat. Time will become an important factor in military operations. Planners will have to gauge the level of domestic support for operations and avoid wars of attrition that exhaust supplies of costly weapons and erode public support.

- **Human and organizational issues.** The single most important factor forcing organizational change is information technology. Military leaders will be increasingly challenged to think, decide, and act more rapidly. This accelerated pace of operations will place increasing demands on logistics systems and the allocation

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[1] *Army After Next Project,* Report to the Chief of Staff of the Army, TRADOC, June 1996.

of forces and firepower. The size of deployed forces is likely to decrease, but the demand placed on them will not diminish.

The output from studies and research that focus on these themes will inform the process required to generate inputs to the annual wargame process. Conversely, the issues generated from the wargames will help inform the research direction.

Figure 4.1 illustrates our proposed AAN annual cycle. It is a process, not a chronology. The objective is to illustrate a process by which the annual AAN wargame series might be better integrated with a comprehensive analytic strategy.

Annual wargames. Although we strive to improve the analytic foundation of the AAN wargames, it should always be their goal to generate issues rather than conclusions or analytic findings. There are two primary reasons for this: (1) the games are set in the distant future (202X), where uncertainties are such that the adjudication process will continue to be dominated by best military judgment, and (2) the
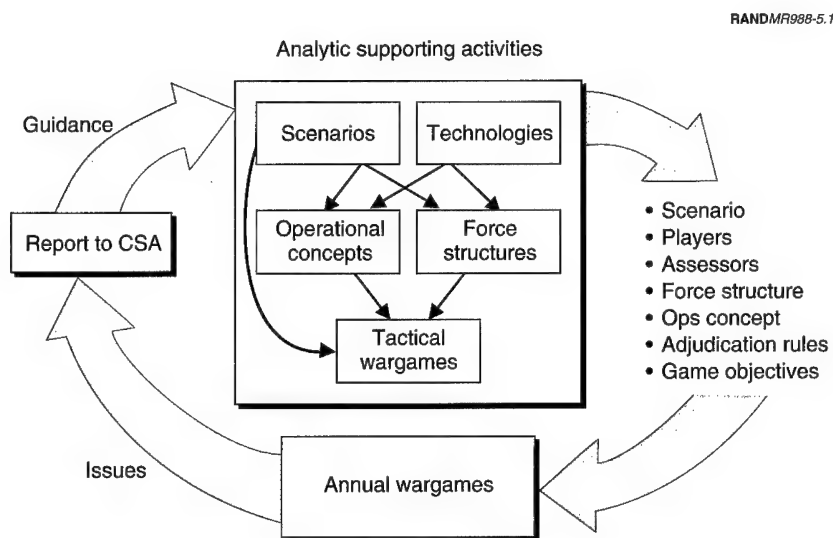
RAND*MR988-5.1*

Figure 4.1—Recommended Annual AAN Study Support Plan

games involve too many teams and interactions to enable confident identification of cause-and-effect relationships.

Annual report to the CSA. The issues generated from the annual wargames serve as partial input to the annual report to the Chief of Staff. Guidance from the Chief of Staff helps focus the next round of analytic activity.

Analytic supporting activities. These represent the studies and research that are either ongoing or that should be part of the ongoing AAN analytic support process. The relationships among the activities are depicted in the diagram and all directly influence the annual tactical wargames held at TRAC and the various games designed to explore special topics. The idea is to establish standing analytic tracks in each of these areas that inform the annual wargames through:

- Scenarios that have been exposed to a much broader audience than at present.

- Better trained players and assessors. We would expect that the participants in the annual research efforts would form a nucleus of player/assessors that would bring both continuity and experience to the process.

- Force structures and their accompanying operational concepts. These form an important element of the annual wargames in that they directly influence the issues generated. A systematic approach to generating alternative force structures and operational concepts will ensure that technology is applied credibly, that the force is realistically deployed and employed, and that projected force costs are reasonable.

- Using the annual tactical wargames held at TRAC to increase the existing set of adjudication rules by adding to the set of vignettes. Encouraging the participation of the other services in the tactical wargames will broaden the adjudication rule set and move us closer to (but surely never arrive at) a complete rule set.

The annual wargame series can be viewed as capstones to a year or more's study or as the foundation for the next round of research. Both views are correct in that the wargames generate issues that focus subsequent research, and they draw on research results to pro-

vide game inputs, rationalize the adjudication process, and train players and adjudicators.

The supporting activities are seen as standing research and study groups that meet periodically to report on significant results. It is not the intent of this process to focus entirely on producing inputs for the annual AAN wargame series, but rather to provide a continuing dialog focusing on issues affecting the Army beyond the current Program Objective Memorandum cycle. We recommend that the following activities be institutionalized for this purpose:

- **Scenario generation.** The primary objective is to examine and understand a wide range of contingencies for 202X. It is useful to have a series of scenarios that will facilitate understanding of the nature of future warfare. The objective is not to write the scenarios for the AAN wargames, but rather to provide a resource to the wargame designers as they prepare for the next game.

- **Technology assessment.** Military planners must understand the technologies that have military potential. Sifting through the wide range of projected technological applications to find those with true military potential requires a study team with a mix of scientists and military operators. The studies will inform the developing force structures and operational concepts. It may also be possible for these technologies to pose interesting scenario variants. For example, the introduction of a nonfossil fuel may produce a strategic vulnerability if there are only a small number of locations where such fuel is processed—and the sites are well known.

- **Development of force structures.** The development of a future force structure is not the primary objective of the annual AAN wargame process. However, the technologies, manpower, logistics, and training needed to support a future force directly affect near-term as well as future budgets. Consequently, the force structures used in the wargames play a direct role in fulfilling the CSA's goal to connect the Army's long-term vision to the research and development process.

- **Operational concepts generation.** The development of an operational concept usually takes place in conjunction with the development of the force structure the concept is designed to sup-

port. However, how a unit fights also depends upon social and moral dynamics as well as upon new technologies inherent in the structure. Domestic support for prolonged operations and tolerance of wars of attrition will clearly color operational concepts. A more practical view is that the reliance on expensive high-technology equipment and the personnel to operate it will clearly affect how the forces are employed.

• **Tactical wargames.** The tactical wargames held annually at TRAC provide the adjudication rules needed to rationalize the assessment process. As time goes on, the set of vignettes will increase to cover a wider variety of combat situations to include situations involving other services' forces. Figure 4.2 depicts the process and the supporting studies and analysis.

Although depicted chronologically, the annual AAN study process is more likely to be a parallel process. That is, as AAN wargames are
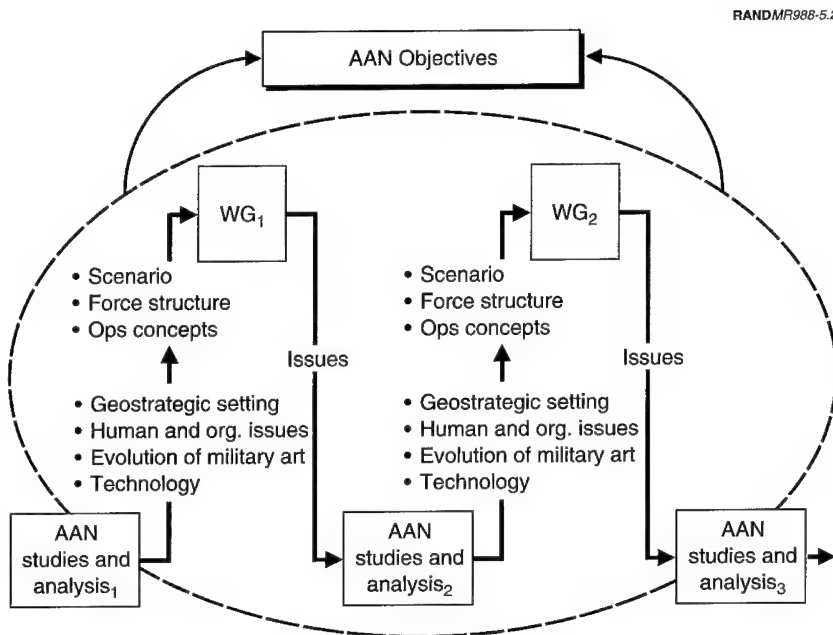

Figure 4.2—Linking Objectives to Wargames

being planned, planners will draw on the most recent reports generated by the various study groups. Therefore, instead of directly affecting the next game, the output from an analysis group may be felt only several games later. This is especially true if the TRADOC planners adhere to the currently planned summer/winter schedule.

The AAN process must be viewed as the execution of a coherent, analytically sound research plan focused on informing the AAN strategic objectives. Given the importance of this process to the long-term vision of the Army there is a strong argument to be made that this process, or some refined version of it, should become institutionalized within the Army as a means of constantly reviewing its future direction.

The WWG was extremely successful as a process for exploring and generating important issues about combat in 2020. In fact, all participants surfaced issues, not just the players. Most participants were disappointed with some aspect of the game; however, almost all felt that the process was worthwhile and were willing to give the Army high marks for being as inclusive as it was.

Although the AAN wargames are not analytic, more structure can be introduced to drive them closer to the analytic game format without sacrificing the informal atmosphere that is so conducive to generating new ideas.

Improvements in the wargames center on changes in the design and execution of the games and in technical and administrative game processes. It is important that the AAN process achieve external credibility. To do this, it must be seen as an analytically sound process in which the annual wargame series is embedded in a more comprehensive analytic program.

ARMY AFTER NEXT STUDY OBJECTIVES

The Arroyo Center has suggested seven broad AAN strategic study objectives and several issues associated with each of them that might be explored through wargames. The objectives listed here were developed by TRADOC and together articulate the broad goals of the AAN study. The Arroyo Center issues have been included as issues supporting the TRADOC objectives.

By 2020, can qualitative advantages offset quantity in a war of strategic depth and width? If so, how?

World-class research and a dynamic civilian economy are expected to give the United States an important technological advantage over any major competitor well into the next century. The United States is expected to exploit this advantage, leading to the development of new operational and tactical concepts that result in new weapon systems and doctrine for their employment. The current U.S. advantage in information technology will expand, U.S. forces will enjoy greater strategic and operational mobility, and new power sources will likely be available along with weapon systems with considerably greater firepower. The services will be composed of sophisticated forces that can prevail against a major competitor that is likely to field larger, but less sophisticated forces.

In 2020, what are the elements of a strategic posture that deter and prevent conflict?

Fundamentally, the United States has to deter nuclear attack on its own territory and on U.S. forces. In addition, it will have to deter and

defend against nuclear and conventional attacks against its allies within theaters of war and it may also seek to deter and prevent other forms of conflict. The United States can deter aggression by showing the will and power to negate any advantage a major competitor might hope to gain through aggression. To this end, the United States should develop a credible defense against WMD and the ability to retaliate.

How can the United States control escalation or geographic expansion of war?

As the foremost member of a highly interdependent global economy, the United States is vulnerable to its disruption. Therefore, the United States should try to prevent a major competitor from interfering with the global economy and related information services. Shielding the world economy from disruption will employ all aspects of U.S. national power and also require combined efforts. The United States also has to shield its domestic economy from hostile intrusions against the infrastructure, including the information infrastructure. The United States might isolate an enemy through blockade and interdiction. It might seek to contain conflict through the rapid introduction of land forces to strategic locations. At the same time, the United States will have to guard against being diverted by proxy wars.

What are war termination options for the United States against major competitors?

Success in war against a major competitor would probably be short of a complete victory for several reasons: A major competitor might stave off defeat by threatening to resort to weapons of mass destruction (WMD). Or the United States might decide that complete victory would not be in U.S. interests because it would magnify the power of another potentially hostile state. For example, Russia's defeat would magnify China's power. Therefore, in war against a major competitor, the United States would probably seek termination on terms short of victory. During the conflict, the United States would try to limit damage to its friends and allies. It would probably aim to restore their territory and subsequently to erect obstacles to renewed aggression.

What are the strategic and operational implications of deployment of effective national and theater missile defenses?

Systems exist today that allow for the low-altitude and low-observable delivery of conventional munitions and WMD. By 2020, many of these weapons will have strategic reach, thus creating a need for effective national as well as theater defensive systems. Unfriendly states that acquire WMD or sophisticated conventional munitions might try to intimidate U.S. allies and to deter deployment of U.S. forces. During hostilities, they might use WMD if their leadership believed these weapons would negate advantages enjoyed by more sophisticated U.S. forces. The United States should defend U.S. forces against these threats and make its forces more survivable.

What are the strategic and operational implications of forward-based forces?

U.S. forces will be more technologically advanced but also relatively small and difficult to replace. The forward deployment of forces puts them at greater risk of preemption and surprise, thus increasing their vulnerability. At the same time, deploying forces from safe havens in the United States or elsewhere is time consuming—even in the 2020 timeframe. In addition, the forward basing of U.S. forces on allied territory has traditionally been a clear signal of U.S. resolve that might be brought into question by CONUS basing.

What are the strategic and operational implications of greatly improved power sources for U.S. capabilities?

Although U.S. forces have far greater combat power than they did during World War II, their logistics tether has hardly lengthened, since they still require fossil fuels to operate. A new power source might lengthen this tether or even create for land forces an operational depth and flexibility analogous to that enjoyed by navies. But novel sources of power are likely to rely on a specialized production base and logistics infrastructure.

PROJECT DESCRIPTION

STRATEGIC ANALYSIS OF THE ARMY AFTER NEXT (AAN) WINTER WARGAME (WWG)

Sponsor: Deputy Chief of Staff for Doctrine, U.S. Army Training and Doctrine Command

Project Duration: July 1996–June 1997

FY96 Level of Effort: 1 MTS

Program/Director: Strategy and Doctrine (Tom McNaugher)

Project Leaders: Walter L. Perry and M. Dean Millot

OBJECTIVE

The Army After Next (AAN) project, led by TRADOC, was initiated to link Force XXI to a longer-term vision of the Army that extends well into the next century and ensure that this vision informs the development Army research and development requirements. To support AAN analysis, TRADOC is conducting a series of high-level wargames set in the year 2025. The Arroyo Center's role is to assist TRADOC in these exercises by: (1) providing a "strategies-to-task" analytical framework to evaluate the AAN; (2) identifying issues, derived from strategic objectives in the framework, to be explored in the wargames; (3) managing the collection of data from high-level participants in the games; and (4) assessing game results.

BACKGROUND

TRADOC plans to conduct wargames to explore issues affecting the development of the U.S. Army circa 2010, the projected "wear-out" period for current weapon systems. The first will be held at the Center for Leadership Development at the Army War College in January 1997. In this first game, considerable emphasis is being placed on what its planners are calling the "strategic level," a term meant to encompass the political-military aspects of warfare.

TASKS

Task 1: Develop a "Strategy-to-Tasks" framework for analysis of the AAN.

Based on the June 1996 Report to the Army Chief of Staff on the Army After Next, and drawing upon RAND's "strategies-to-task" methodology, the Arroyo Center will develop a comprehensive framework for analysis of the AAN. The framework will consist of nested sets of strategic, operational, and tactical ("task") level objectives. The strategic objectives will inform the Arroyo Center's assessment of the results of high-level game play. Operational and tactical level objectives will be offered as an input to the work of other participants in the AAN project.

Task 2: Define issues to be examined in the strategic level of the Winter Wargame.

Based on strategic objectives in the analytical framework, the Arroyo Center will propose a set of political-military issues for WWG game designers to use in their design of the scenario for high-level play.

Task 3: Manage the collection of data from high-level game play.

Using the political-military issues incorporated into the design of the scenario for high-level play, the Arroyo Center will develop a guide for data collection during the WWG, train data collectors provided by TRADOC, and direct the data-collection process during exercise play.

Task 4: Assess the results of high-level game play.

The Arroyo Center will assess the results of high-level play in the context of the strategic issues developed for the high-level scenario. The assessment will identify patterns of political-military thinking that Army planners should consider in their development of the AAN, review the utility of the approach taken for this first game in the AAN series, and recommend important issues and possible improvements for subsequent games.

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